

## WHAT IS CLAIMED IS:

1       1. For use in an oscillator, a two port differential mode  
2 SAW resonator circuit for providing low phase noise in hostile  
3 environments comprising:

4           a two port SAW resonator having two inputs and two  
5 outputs;

6           at least one inductance coupled to one or more inputs or  
7 outputs of the SAW resonator, wherein the at least one inductance  
8 is connected and sized to approximately tune out a stray  
9 capacitance seen across the inputs or outputs within an equivalent  
10 circuit for the SAW resonator at a selected frequency; and

11           at least one variable tuning capacitance connected in  
12 series with the one or more inputs or outputs of the SAW resonator,  
13 wherein the at least one tuning capacitance may be employed to  
14 alter a resonant frequency of the SAW resonator circuit.

1       2. The two port differential mode SAW resonator circuit as  
2 set forth in Claim 1 wherein the at least one inductance further  
3 comprises an inductor connected across the inputs of the SAW  
4 resonator.

1           3.    The two port differential mode SAW resonator circuit as  
2 set forth in Claim 2 wherein the inductor further comprises a  
3 center tap inductor connected at a center tap through a resistance  
4 to a ground voltage level.

1           4.    The two port differential mode SAW resonator circuit as  
2 set forth in Claim 1 wherein the at least one variable tuning  
3 capacitance further comprises:

4               a first varactor diode serially connected within a first  
5 differential signal line to a first input of the SAW resonator; and

6               a second varactor diode serially connected within a  
7 second differential signal line to a second input of the SAW  
8 resonator.

1           5.    The two port differential mode SAW resonator circuit as  
2 set forth in Claim 4, further comprising:

3               a first resistor connecting the first differential signal  
4 line to a tuning voltage level; and

5               a second resistor connecting the first differential  
6 signal line to the tuning voltage level.

1           6.    The two port differential mode SAW resonator circuit as  
2 set forth in Claim 5, further comprising:

3               blocking capacitances serially connected within each of  
4 the first and second differential signal lines.

1           7.    The two port differential mode SAW resonator circuit as  
2 set forth in Claim 1 wherein adjusting a capacitance of the at  
3 least one variable tuning capacitance alters the resonant frequency  
4 for the SAW resonator circuit by altering a total capacitance for  
5 a series resonator circuit formed by a series resonator within the  
6 equivalent circuit for the SAW resonator and the at least one  
7 tuning capacitance.

1        8.    An oscillator comprising:  
2            a differential amplifier; and  
3            a two port differential mode SAW resonator circuit  
4 connected in a series loop with the differential amplifier for  
5 providing low phase noise in hostile environments comprising:  
6            a two port SAW resonator having two inputs and two  
7            outputs;  
8            at least one inductance coupled to one or more  
9            inputs or outputs of the SAW resonator, wherein the at least  
10           one inductance is connected and sized to approximately tune  
11           out a stray capacitance seen across the inputs or outputs  
12           within an equivalent circuit for the SAW resonator at a  
13           selected frequency; and  
14           at least one variable tuning capacitance connected  
15           in series with the one or more inputs or outputs of the SAW  
16           resonator, wherein the at least one tuning capacitance may be  
17           employed to alter a resonant frequency of the SAW resonator  
18           circuit.

1           9. The oscillator as set forth in Claim 8 wherein the at  
2 least one inductance further comprises an inductor connected across  
3 the inputs of the SAW resonator.

1           10. The oscillator as set forth in Claim 9 wherein the  
2 inductor further comprises a center tap inductor connected at a  
3 center tap through a resistance to a ground voltage level.

1           11. The oscillator as set forth in Claim 8 wherein the at  
2 least one variable tuning capacitance further comprises:

3               a first varactor diode serially connected within a first  
4 differential signal line to a first input of the SAW resonator; and

5               a second varactor diode serially connected within a  
6 second differential signal line to a second input of the SAW  
7 resonator.

1 12. The oscillator as set forth in Claim 11, further  
2 comprising:

3 a first resistor connecting the first differential signal  
4 line to a tuning voltage level; and

5 a second resistor connecting the second differential  
6 signal line to the tuning voltage level.

1 13. The oscillator as set forth in Claim 12, further  
2 comprising:

3 blocking capacitances serially connected within each of  
4 the first and second differential signal lines.

1 14. The oscillator as set forth in Claim 8 wherein adjusting  
2 a capacitance of the at least one variable tuning capacitance  
3 alters the resonant frequency for the SAW resonator circuit by  
4 altering a total capacitance for a series resonator circuit formed  
5 by a series resonator within the equivalent circuit for the SAW  
6 resonator and the at least one tuning capacitance.

1        15. For use in an oscillator, a method of tuning a SAW  
2 resonator circuit while maintaining low phase noise comprising the  
3 steps of:

4                applying a differential input signal to a two port  
5 differential mode SAW resonator having two inputs and two outputs,  
6 wherein a stray capacitance seen across the inputs or outputs  
7 within an equivalent circuit for the SAW resonator is approximately  
8 tuned out at a selected frequency; and

9                adjusting a total capacitance for a series resonator  
10 circuit formed by a series resonator within the equivalent circuit  
11 for the SAW resonator and at least one variable tuning capacitance  
12 connected to an input or output of the SAW resonator.

1        16. The method of claim 15 further comprising:

2                exciting at least one inductance coupled across the  
3 inputs or outputs of the SAW resonator, wherein the at least one  
4 inductance is connected and sized to approximately tune out the  
5 stray capacitance at the selected frequency.

1 17. The method of claim 16, wherein the step of exciting at  
2 least one inductance coupled across the inputs or outputs of the  
3 SAW resonator further comprises:

4 exciting a center-tap inductor connected at the center  
5 tap through a resistance to a ground voltage level.

1 18. The method of claim 15 wherein the step of adjusting a  
2 total capacitance for a series resonator circuit formed by a series  
3 resonator within the equivalent circuit for the SAW resonator and  
4 at least one variable tuning capacitance connected to an input or  
5 output of the SAW resonator further comprises:

6 altering a tuning voltage applied to first and second  
7 varactor diodes serially connected within first and second  
8 differential signal lines to the inputs or outputs of the SAW  
9 resonator.

1 19. The method of claim 15 further comprising:

2 employing a differential oscillator including the SAW  
3 resonator circuit.



1           20. The method of claim 19 further comprising:  
2           altering a frequency at which the differential oscillator  
3 oscillates by adjusting the total capacitance for the series  
4 resonator circuit.

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